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(54)【発明の名称】　半導体製造装置

1

【特許請求の範囲】

【請求項１】多数の半導体ウエハを製造単位に区分して収納し、所定の処理工程のデータが入力可能な複数の処理前キャリアと、上記複数の各処理前キャリアをそれぞれの入力データに基づいて順次送り出す機構を有する処理前キャリア収納部と、上記処理前キャリア内に収納された半導体ウエハに対する各種処理を行なう複数の処理槽と、処理液を秤量しかつ所定の温度に制御して上記各処理槽内に供給する秤量槽と、上記各処理槽の使用順序および処理時間に合せて上記各処理前キャリアを次工程に順次搬送する搬送機構と、上記各処理前キャリアに入力されたデータに基づき、上記各処理槽および搬送機構の使用時間が重複しないタイミングを算出して各処理槽への各種処理液の供給タイミングを算出し、この算出結果に応じて上記秤量槽での各種処理液の秤量、温度制御

2

および各処理槽への供給、各処理槽での温度制御もしくは各種処理液の排出動作および搬送機構の動作を制御する制御手段とを具備したことを特徴とする半導体製造装置。

【発明の詳細な説明】

［発明の技術分野］

この発明は半導体ウエハの洗浄処理、エッチング処理等を行なう半導体製造装置に関する。

［発明の技術的背景］

半導体ウエハの洗浄処理、エッチング処理等を行なう半導体製造装置は、一般に第１図のように構成されている。すなわち、第１図において10は、処理前の半導体ウエハを製造単位（ロット）毎に区分して収納する複数台の処理前キャリア11、…11所定の位置に配置された処理前キャリア収納部である。この処理前キャリア収納部10

内の処理前キャリア11は、搬送機構20により第１ないし第３の処理槽31ないし33に搬送され、さらに処理後は処理後キャリア収納部50内に処理後キャリア51として収納される。上記第１、第２の処理槽31および32はそれぞれ、処理前キャリア11内に収納されている半導体ウエハに対して薬液による洗浄処理を行ない、第３の処理槽33は上記薬液による洗浄処理が行われた半導体ウエハに対し、純水による水洗処理を行なう。そして上記第１、第２の処理槽31および32には各槽内に供給される薬液を昇温するためのヒータ34、35と薬液の温度を検出するための温度センサ36、37が設けられており、第１ないし第３の処理槽31ないし33には薬液もしくは純水を排出するための排出用の電磁弁38ないし40が設けられている。

61ないし63は上記第１の処理槽31に供給すべき薬液を秤量および温度制御する秤量槽であり、秤量槽61には電磁弁64を介して純水が、秤量槽62には電磁弁65を介して過酸化水素水（H_2O_2）が、秤量槽63には電磁弁66を介して塩酸（Hcl）がそれぞれ供給される。純水が供給される秤量槽61には、この純水を昇温するためのヒータ67と温度検出用の温度センサ68とが設けられており、さらに上記秤量槽61ないし63には秤量完了センサ69ないし71が設けられている。そしてこれら各秤量槽61ないし63で秤量された各薬液もしくは純水は、供給用の電磁弁72ないし74それぞれを介して上記第１の処理槽31に供給され、ここで上記各薬液および純水からなる混合処理液が形成される。

81ないし83は上記第２の処理槽32に供給すべき薬液を秤量および温度制御する秤量槽であり、上記第１の処理槽31に供給すべき薬液を秤量する秤量槽61ないし63の場合と同様に、秤量槽81には電磁弁84を介して純水が、秤量槽82には電磁弁85を介して過酸化水素水が、秤量槽83には電磁弁86を介して塩酸がそれぞれ供給される。さらに純水が供給される秤量槽81には、この純水を昇温するためのヒータ87と温度検出用の温度センサ88とが設けられており、上記秤量槽81ないし83には秤量完了センサ89ないし91が設けられている。そしてこれら各秤量槽81ないし83で秤量された各薬液もしくは純水は、供給用の電磁弁92ないし94それぞれを介して第２の処理槽32に供給され、ここで上記各薬液および純水からなる混合処理液が形成される。

第３の処理槽33については、供給用の電磁弁41を介して純水が供給されるようになっている。

このような構成の半導体製造装置を用いて、例えば第１の処理槽31、第２の処理槽32を選択的に使用して、塩酸、過酸化水素および純水からなる混合処理液により半導体ウエハの洗浄処理を行ない、さらに続いて第３の処理槽33が純水による水洗処理を行なう場合、従来では次のようにして処理を行なっている。すなわち、まず半導体ウエハが処理前キャリア11に収納された状態で処理前キャリア収納部10に配置、配列される。各処理前キャリア11にはそれぞれのキャリア内の半導体ウエハの処理に必要なデータが入力可能なデータ入力装置が設けられており、予め各処理前キャリア11に対して処理工程データおよび各処理槽31ないし33での処理時間データが入力される。上記各処理前キャリア11に入力された処理工程データおよび処理時間データに基づき、それぞれの処理前キャリア11が処理槽31ないし33で処理されるのに要する処理期間および搬送機構20がそれぞれの処理前キャリア11を搬送する期間が重複しないようなスケジュールに基づいて処理が進められる。

第４図はこの処理スケジュールを示す図である。この例は６台の処理前キャリア11が処理される場合である。第４図において、t1ないしt5はそれぞれ１台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間であり、t1は搬送機構20が１台目の処理前キャリア11を第１の処理槽31に搬送するまでの期間、t2はこの１台目の処理前キャリア11を第１の処理槽31で処理する期間、t3は搬送機構20が第１の処理槽31で処理された１台目の処理前キャリア11を第３の処理槽31まで搬送する期間、t4は１台目の処理前キャリア11を第３の処理槽33で処理する期間、t5は搬送機構20が第３の処理槽31で処理された１台目の処理前キャリア11を処理後キャリア収納部50まで搬送する期間である。

t11ないしt15はそれぞれ２台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間であり、t11は搬送機構20が第３の処理槽33の位置から処理前キャリア収納部10の位置まで戻り、さらに２台目の処理前キャリア11を第１の処理槽31に搬送するまでの期間、t12はこの２台目の処理前キャリア11を第１の処理槽31で処理する期間、t13は搬送機構20が第１の処理槽31で処理された２台目の処理前キャリア11を第３の処理槽31まで搬送する期間、t14は２台目の処理前キャリア11を第３の処理槽33で処理する期間、t15は搬送機構20が第３の処理槽31で処理された２台目の処理前キャリア11を処理後キャリア収納部50まで搬送する期間である。

t21ないしt25はそれぞれ３台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間であり、これらの期間は上記２台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間t11ないしt15に対応している。

t31ないしt35はそれぞれ４台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間であり、t31は搬送機構20が第３の処理槽33の位置から処理前キャリア収納部10の位置まで戻り、さらに４台目の処理前キャリア11を第２の処理槽32に搬送するまでの期間、t32はこの４台目の処理前キャリア11を第２の処理槽32で処理する期間、t33は搬送機構20が第２の処理槽32で処理された４台目の処理前キャリア11を第３の処理槽31まで搬送する期間、t34は４台目の処理前キャリ

ア11を第３の処理槽33で処理する期間、t35は搬送機構20が第３の処理槽31で処理された４台目の処理前キャリア11を処理後キャリア収納部50まで搬送する期間である。

t41ないしt45、t51ないしt55はそれぞれ５台目、６台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間であり、これらの期間は上記４台目の処理前キャリア11についての処理およびこの処理に伴う搬送機構20の動作期間t31ないしt35にそれぞれ対応している。そして、例えば各処理槽31ないし33での処理時間がそれぞれ５分であり、それぞれの処理槽31ないし33における薬液の有効使用時間が18分であるとする。また、第１および第２の処理槽31、32では混合処理液の温度が85℃で処理が行われるものとする。

ところで、このようなスケジュールに基づいて実際に処理を進める場合、従来では第５図に示すようなタイミングで各薬液もしくは純水の秤量、昇温、第１ないし第３の処理槽31ないし33への供給動作を制御するようにしている。第５図において、Ａは第１の処理槽31に薬液および純水を供給する秤量槽61ないし63での各種タイミングを示すものであり、a1は秤量を行なっている期間、a2は秤量の完了状態期間、a3は電磁弁72ないし74を開いて、秤量された各薬液および純水を第１の処理槽31内に供給する期間である。Ｂは第１の処理槽31に純水を供給する秤量槽63での昇温タイミングを示すものであり、b1の期間に前記ヒータ68が通電されて90℃まで昇温され、第１の処理槽31に供給される直前まで90℃のまま一定温度に保持される。Ｃは第２の処理槽32に薬液および純水を供給する秤量槽81ないし83での各種タイミングを示すものであり、c1は秤量を行なっている期間、c2は秤量の完了状態期間、c3は電磁弁92ないし94を開いて秤量された各薬液および純水を第２の処理槽32内に供給する期間である。Ｄは第２の処理槽32に純水を供給する秤量槽81での昇温タイミングを示すものであり、d1の期間に前記ヒータ87が通電されて90℃まで昇温され、第２の処理槽32に供給される直前まで90℃のまま一定温度に保持される。Ｅは第１の処理槽31での各種タイミングを示すものであり、e1は前記ヒータ36に通電を行なって内部の処理液の温度を所定温度、すなわち85℃まで昇温する期間、e2は内部処理液が使用有効状態にされている期間であり、e3は電磁弁39を開いて処理液を外部に排出する期間である。そして上記期間e2は前記の薬液使用有効時間18分以内に設定されている。

同様にＦは処理槽32での各種タイミングを示すものであり、f1は前記ヒータ37に通電を行なって内部の処理液の温度を所定温度まで昇温する期間、f2は内部処理液が使用有効状態にされている期間であり、f3は電磁弁40を開いて処理液を外部に排出する期間である。そして上記内部処理液の使用有効状態期間f2も18分以内に設定されている。

なお、第３の処理槽32への純水の供給は常時行なわれ、第３の処理槽33からオーバーフローした分は電磁弁40を介して外部に排出される。

［背景技術の問題点］

上記第４図のようなスケジュールで６台の処理前キャリア11の処理を行なう場合、従来では第５図のようなタイミングで秤量槽61ないし63、81ないし83における各種薬液の秤量、昇温、処理槽31および32への供給を行なうようにしている。従って、処理が開始されると始めの１台目から３台目の処理前キャリア11が第１の処理槽31で洗浄処理されている期間に、処理を行なわない第２の処理槽32でも薬液の供給、排出がなされている。従って、第２の処理槽32内の薬液は全く使用されずに排出されてしまう。このため、この処理槽32に供給される薬液に対する処理前キャリア11の利用効率が悪くなり、またこの処理槽32から薬液を排出し、再び供給する薬液交換動作のために、処理前キャリア11が処理前キャリア収納部10での待ち時間が発生する。この結果、従来では洗浄処理の生産性が悪く、薬液の無駄な使用が発生するという欠点がある。さらに、純水を秤量する秤量槽61、81では、純水が秤量された時点から第１もしくは第２の処理槽31、32に供給される直前まで、ヒータ67、87に通電しなければならないので、無駄な消費電力が多いという欠点もある。

［発明の目的］

この発明は上記のような事情を考慮してなされたものでありその目的は、半導体装置の処理を高い生産性で行なうことができ、しかも薬液の無駄な使用を防止することができ、かつ無駄な電力も消費しない半導体製造装置を提供することにある。

［発明の概要］

上記目的を達成するためこの発明にあっては、多数の半導体ウエハを製造単位に区分して処理前キャリアに収納しかつ所定の処理工程のデータをそれぞれの処理前キャリアに入力し、これら処理前キャリアを処理前キャリア収納部に収納しそれぞれの入力データに基づいてこの処理前キャリア収納部から処理前キャリアを順次送り出し、上記処理前キャリア内に収納された半導体ウエハに対し複数の処理槽で各種処理を行ない、秤量槽により処理液を秤量しかつ所定の温度に制御して上記各処理槽内に供給し、搬送機構により上記各処理槽の使用順序および処理時間に合せて上記各処理前キャリアを次工程に順次搬送し、制御手段により、上記各処理前キャリアに入力されたデータに基づき、上記各処理槽および搬送機構の使用時間が重複しないタイミングを算出して各処理槽への各種処理液の供給タイミングを算出し、この算出結果に応じて上記秤量槽での各種処理液の秤量、温度制御および各処理槽への供給、各処理槽での温度制御もしくは各種処理液の排出動作および搬送機構の動作を制御するようにしている。

［発明の実施例］

以下、図面を参照してこの発明の一実施例を説明する。第２図はこの発明に係る半導体製造装置の電気回路部分の構成を示すブロック図である。図において100は演算処理装置、メモリ等からなる中央制御ユニットである。この中央制御ユニット100にはタイマユニット110および入力／出力ユニット120が接続されている。上記入力／出力ユニット120にはさらに、処理前キャリア収納部10、搬送機構20、前記秤量槽61ないし63、81ないし83における秤量完了センサ69ないし71、89ないし91および電磁弁64ないし66、72ないし74、84ないし86、92ないし94等からなる秤量槽制御ユニット130、前記処理槽31ないし33において各薬液の排出動作を制御する電磁弁38ないし40等からなる処理槽制御ユニット140、前記ヒータ36、37、68、88および温度センサ34、35、67、87等からなるヒータ制御ユニット150、処理後キャリア収納部50がそれぞれ接続されている。

このような構成において、まず各処理前キャリア11に半導体ウエハを収納して処理前キャリア収納部10に配置、配列する。このとき、各処理前キャリア11ではデータ入力装置からキャリア内の半導体ウエハの処理に必要な処理工程データおよび各処理槽31ないし33での処理時間データを入力する。それぞれの処理前キャリア11で入力されたデータは処理前キャリア収納部10に供給され、さらにこれらのデータは入力／出力ユニット120を介して中央制御ユニット100に供給される。これらのデータに基づき、中央制御ユニット100はそれぞれの処理前キャリア11が処理槽31ないし33で処理されるのに要する処理期間および搬送機構20がそれぞれの処理前キャリア11を搬送する期間が重複しないようなスケジュールを作成する。このスケジュールは、例えば処理すべきキャリアが６台である場合には前記第４図と同様のものとなる。さらに中央制御ユニット100は作成されたスケジュールに基づき、第１および第２の処理槽31への薬液の供給タイミングを算出し、さらにこの算出結果に応じて、第１および第２の処理槽31、32の薬液供給、昇温時間、薬液の有効使用時間、薬液の排出時間および秤量槽61ないし63および81ないし83における薬液もしくは純水の秤量時間、純水の昇温開始時間等のタイミングを決定する。これらのタイミングは入力／出力ユニット120を介して処理前キャリア収納部10、搬送機構20、秤量槽制御ユニット130、処理槽制御ユニット140、ヒータ制御ユニット150、処理後キャリア収納部50に供給され、それぞれの動作が制御される。

第３図は前記第５図と同様に、始めの３台の処理前キャリア11は第１の処理槽31で混合薬液による洗浄処理を行なった後に第３の処理槽33で純水による洗浄を行ない、後の３台の処理前キャリア11については第２の処理槽32で混合薬液による洗浄処理を行なった後に第３の処理槽33で純水による洗浄を行なう場合に、中央制御ユニット100で決定された各種タイミングを示す図である。第３図においてＡは第１の処理槽31に薬液および純水を供給する秤量槽61ないし63での各種タイミングを示すものであり、a11は秤量を行なっている期間、a12は秤量の完了状態期間、a13は電磁弁72ないし74を開いて、秤量された各薬液および純水を第１の処理槽31内に供給する期間である。

Ｂは第１の処理槽31に純水を供給する秤量槽63での昇温タイミングを示すものであり、b11の期間に前記ヒータ68が通電されて内部の純水が90℃まで昇温される。

Ｃは第２の処理槽32に薬液および純水を供給する秤量槽81ないし83での各種タイミングを示すものであり、c11は秤量を行なっている期間、c12は秤量の完了状態期間、c13は電磁弁92ないし94を開いて秤量された各薬液および純水を第２の処理槽32内に供給する期間である。

Ｄは第２の処理槽32に純水を供給する秤量槽81での昇温タイミングを示すものであり、d11の期間に前記ヒータ87が通電されて純水が90℃まで昇温される。

Ｅは第１の処理槽31での各種タイミングを示すものであり、e11は前記ヒータ36に通電を行なって内部の処理液の温度を所定温度、すなわち85℃まで昇温する期間、e12は内部処理液が使用有効状態にされている期間であり、e13は電磁弁39を開いて処理液を外部に排出する期間である。

同様にＦは処理槽32での各種タイミングを示すものであり、f11は前記ヒータ37に通電を行なって内部の処理液の温度を所定温度まで昇温する期間であり、f12は内部処理液が使用有効状態にされている期間であり、この期間f12の後に電磁弁40が開かれて処理液が外部に排出される。また、従来と同様に第３の処理槽33への純水の供給は常時行なわれ、第３の処理槽33からオーバーフローした分は電磁弁40を介して外部に排出される。

なお、この例では第１の処理槽31もしくは第２の処理槽32に純水を供給する５分前から秤量槽61、81で純水の昇温を開始するようにしている。

第３図に示すように、第１の処理槽31に薬液が供給され、さらにe11の期間に昇温され、その後、この第１の処理槽31内の処理薬液が使用有効状態にされている期間e12に始めの３台の処理前キャリア11が処理されている期間では、第２の処理槽32には薬液は供給されない。すなわち、第２の処理槽32に対する薬液の供給は第１の処理槽32における処理が終了する直前に行われる。すなわち、処理が開始されると始めの１台目から３台目の処理前キャリア11が第１の処理槽31で洗浄処理されている期間に、処理を行なわない第２の処理槽32では薬液が供給されず、従来、無駄に排出されていた薬液が節約できる。この結果、処理槽32に供給される薬液に対する処理前キャリア11の利用効率を向上させることができる。またこの処理槽32に対して薬液を供給するタイミングは、第１の処理槽31における処理の進行状況をみて決定でき

るので、処理前キャリア11の処理前キャリア収納部10での待ち時間は最小にできる。従って、この実施例装置によれば洗浄処理の生産性を向上させることができ、かつ薬液の無駄な使用の発生を防止することができる。さらに、純水を秤量する秤量槽61、81では、純水を第１もしくは第２の処理槽31、32に供給するタイミングの一定時間前からヒータ67、87に通電して昇温するようにしているので、無駄な消費電力を節約することができる。

なお、この発明は上記実施例に限定されるものではなく種々の変形が可能であることはいうまでもない。例えば上記実施例装置では混合された薬液の使用有効期限が18分という時間である場合について説明したが、これは使用回数が何回というようないうような回数の有効期限であってもよい。さらに薬液の種類、処理槽の数、処理槽の使用順序等は、処理する半導体ウエハの処理条件に適合するように換えても良いことはもちろんである。さらに上記実施例装置は半導体ウエハの洗浄処理を行なうものである場合について説明したが、これはその他のエッチング処理等を行なう装置にも実施することができる。

［発明の効果］

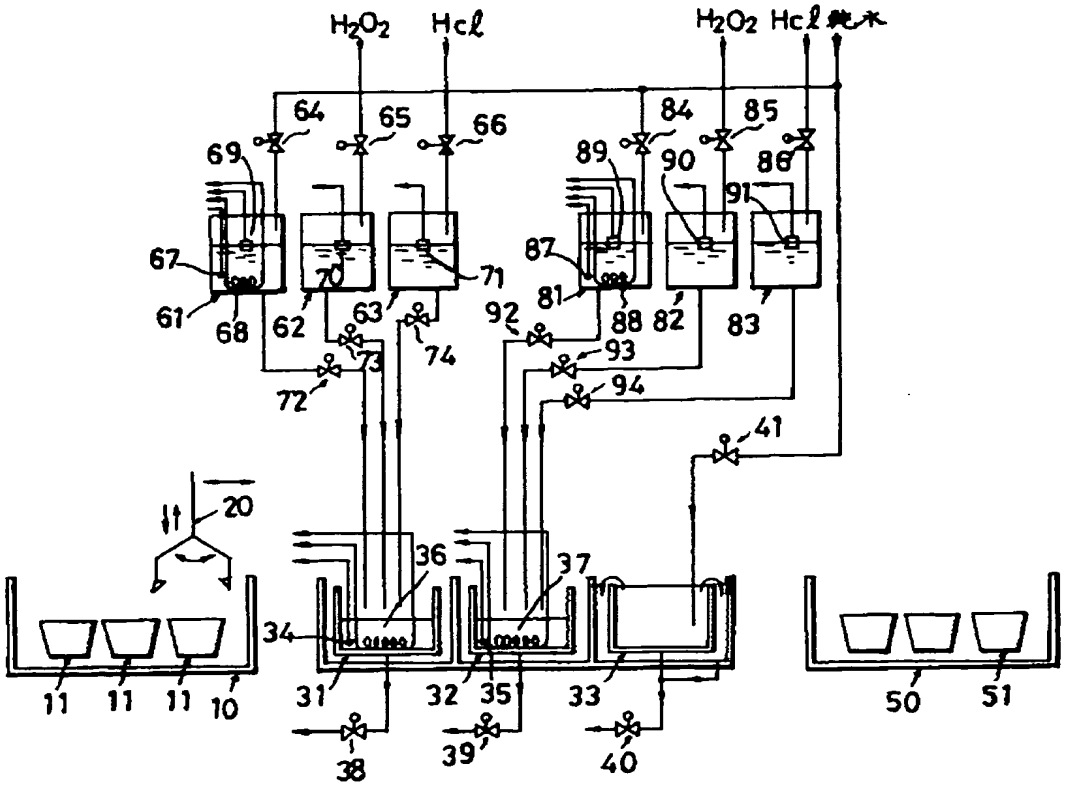
以上説明したようにこの発明によれば、処理槽への効果的な薬液の供給および昇温もしくは排出を行なうので、＊各処理槽における薬液を対するキャリアの利用効率が良く、純水の秤量を行なう秤量槽での昇温時間が短縮でき、処理槽の薬液の交換動作のために処理前キャリアが待たされることがなくキャリアの処理進行ができるので、半導体装置の処理を高い生産性で行なうことができ、しかも薬液の無駄な使用を防止することができ、かつ無駄な電力も消費しない半導体製造装置を提供することができる。

【図面の簡単な説明】

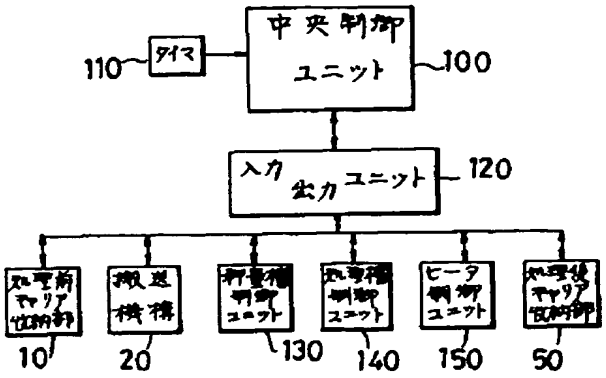
第１図は一般的な半導体製造装置の構成図、第２図はこの発明に係る半導体製造装置の電気回路部分の構成を示すブロック図、第３図は上記実施例装置の動作タイミングを示す図、第４図は上記第１図の装置における処理のスケジュールの一例を示す図、第５図は従来装置の動作タイミングを示す図である。

10……処理前キャリア収納部、11……処理前キャリア、20……搬送機構、31,32,33……処理槽、50……処理後キャリア収納部、51……処理後キャリア、61,62,63,81,82,83……秤量槽、100……中央制御ユニット、110……タイマユニット、120……入力／出力ユニット、130……秤量槽制御ユニット、140……処理槽制御ユニット、150……ヒータ制御ユニット。

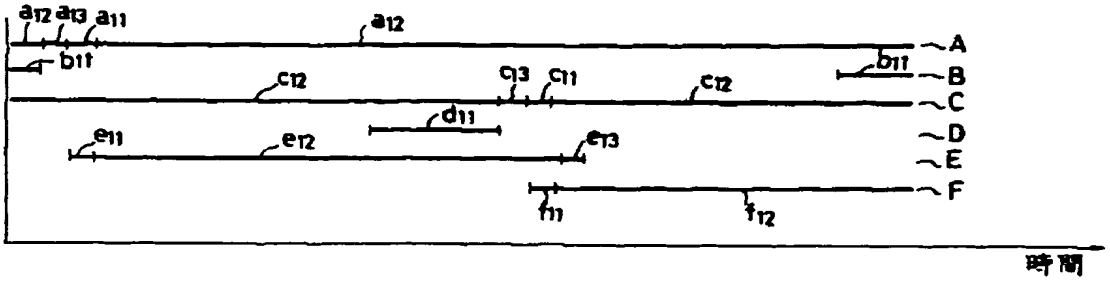
【第１図】



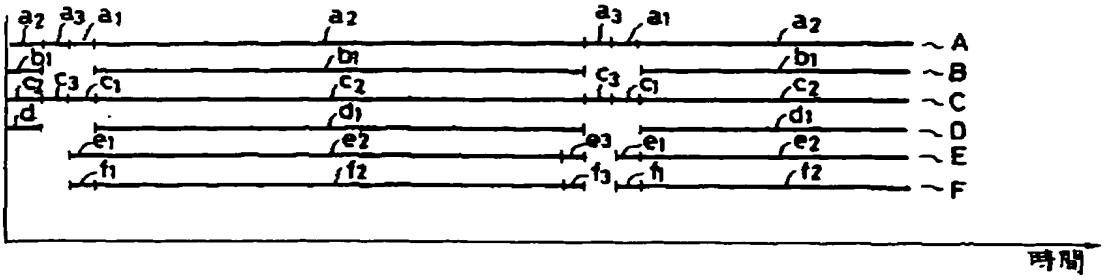
【第2図】


中央制御ユニット
100
タイマ
110
入力出力ユニット
120
搬送機構
20
130
140
150
50
10

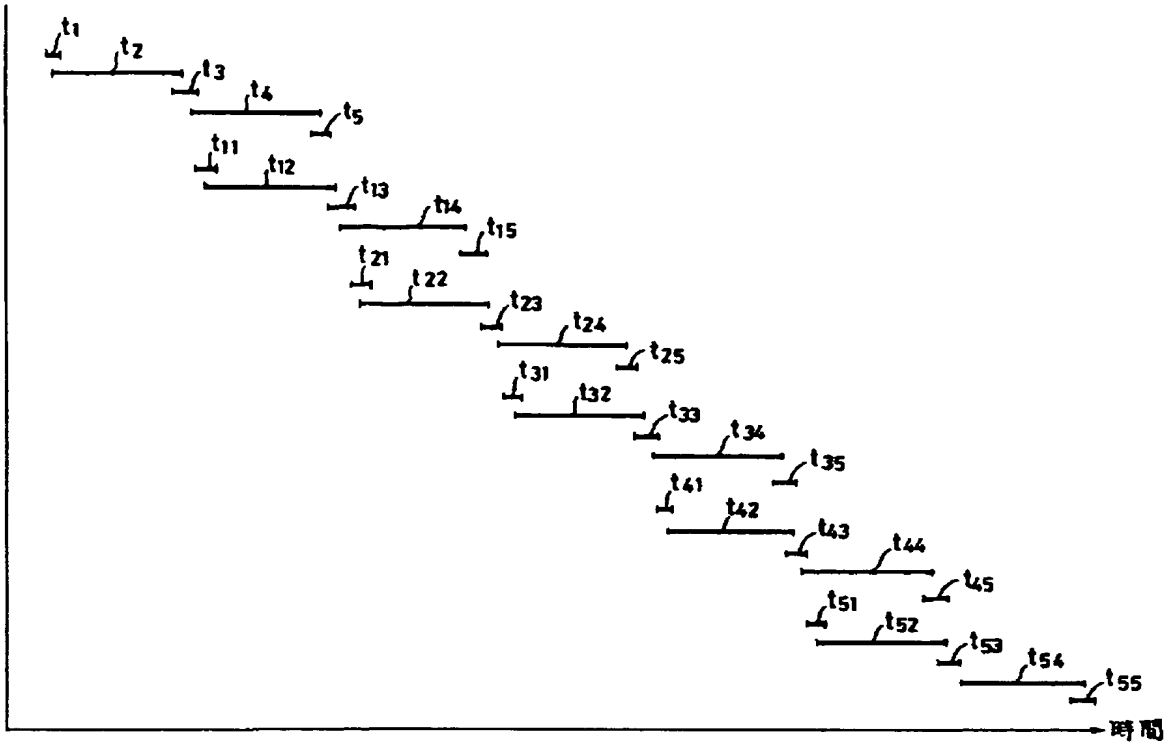
【第3図】


A
B
C
D
E
F
時間

【第5図】


A
B
C
D
E
F
時間

【第４図】



フロントページの続き

(51)Int.Cl.⁶	識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｈ０１Ｌ　21/68			Ａ	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Semiconductor fabrication machines and equipment characterized by providing the following. many semiconductor wafers — a manufacture unit — classifying — containing — two or more front [processing] carriers which can input the data of predetermined down stream processing The front [processing] carrier stowage which has the mechanism in which two or more above-mentioned carriers before processing of each are sent out one by one based on each input data Two or more processing tubs which perform various processings to the semiconductor wafer contained in the above-mentioned front [processing] carrier The weighing capacity tub which carries out weighing capacity of the processing liquid, and controls to predetermined temperature, and is supplied in each above-mentioned processing tub, The conveyance mechanism in which each above-mentioned carrier before processing is conveyed one by one at the following process according to the use sequence and the processing time of each above-mentioned processing tub, The supply timing of the various processing liquid to each processing tub is computed by computing the timing which the time of each above-mentioned processing tub and a conveyance mechanism does not overlap based on the data inputted into each above-mentioned carrier before processing. Control means which control discharge operation of the temperature control in supply to the weighing capacity, the temperature control, and each processing tub of various processing liquid in the above-mentioned weighing capacity tub, and each processing tub, or various processing liquid, and operation of a conveyance mechanism according to this calculation result

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[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
This invention relates to the semiconductor fabrication machines and equipment which perform washing processing of a semiconductor wafer, etching processing, etc.
Background of the Invention]
Generally, the semiconductor fabrication machines and equipment which perform washing processing of a semiconductor wafer, etching processing, etc. are constituted, as shown in a view 1. That is, in a view 1, 10 is a front [processing] carrier stowage arranged at two or more set carrier 11 of before processing which classifies the semiconductor wafer before processing into every manufacture unit (lot), and contains it, and —11 position. The carrier 11 before processing in this front [processing] carrier stowage 10 is conveyed by the 1st or 3rd processing tub 31 or 33 according to the conveyance mechanism 20, and after processing is further contained as an after [processing] carrier 51 in the after [processing] carrier stowage 50. The above 1st and the 2nd processing tub 31 and 32 perform washing processing by the medical fluid to the semiconductor wafer contained in the front [processing] carrier 11, respectively, and the 3rd processing tub 33 performs rinsing processing by pure water to the semiconductor wafer with which washing processing by the above-mentioned medical fluid was performed. And the temperature sensors 36 and 37 for detecting the heaters 34 and 35 for carrying out the temperature up of the medical fluid supplied in each tub and the temperature of a medical fluid are formed in the above 1st and the 2nd processing tub 31 and 32, and the solenoid valve 38 for the eccrisis for discharging a medical fluid or pure water or 40 is prepared in the 1st or 3rd processing tub 31 or 33.
It is weighing capacity and the weighing capacity tub which carries out a temperature control, and a hydrochloric acid (Hcl) is supplied [pure water] for hydrogen peroxide solution (H2O2) to the weighing capacity tub 61 through a solenoid valve 66 at the weighing capacity tub 63 at the weighing capacity tub 62 through a solenoid valve 65 through a solenoid valve 64, respectively in the medical fluid which should supply 61 or 63 to the processing tub 31 of the above 1st. The heater 67 for carrying out the temperature up of this pure water and the temperature sensor 68 for temperature detection are formed in the weighing capacity tub 61 to which pure water is supplied, and the weighing capacity completion sensor 69 or 71 is further prepared in the above-mentioned weighing capacity tub 61 or 63. and each medical fluid or pure water by which weighing capacity was carried out by each [these] weighing capacity tub 61 or 63 — the solenoid valve 72 for supply, or 74 — the processing tub 31 of the above 1st is supplied through each, and the mixed processing liquid which consists of each above-mentioned medical fluid and pure water here is formed
A hydrochloric acid is supplied [pure water] for hydrogen peroxide solution through a solenoid valve 86 in the weighing capacity tub 83 through a solenoid valve 85 in the weighing capacity tub 82 through [like the case of the weighing capacity tub 61 which carries out weighing capacity of the medical fluid which is the weighing capacity and weighing capacity tub which carries out a temperature control about the medical fluid which should supply 81 or 83 to the processing tub 32 of the above 2nd, and should be supplied to the processing tub 31 of the above 1st, or 63] a solenoid valve 84 in the weighing capacity tub 81, respectively The heater 87 for carrying out the

temperature up of this pure water and the temperature sensor 88 for temperature detection are formed in the weighing capacity tub 81 to which pure water is furthermore supplied, and the weighing capacity completion sensor 89 or 91 is prepared in the above-mentioned weighing capacity tub 81 or 83. and each medical fluid or pure water by which weighing capacity was carried out by each [these] weighing capacity tub 81 or 83 — the solenoid valve 92 for supply, or 94 — the 2nd processing tub 32 is supplied through each, and the mixed processing liquid which consists of each above-mentioned medical fluid and pure water here is formed

About the 3rd processing tub 33, pure water is supplied through the solenoid valve 41 for supply. When the 1st processing tub 31 and the 2nd processing tub 32 are used alternatively, the mixed processing liquid which consists of a hydrochloric acid, a hydrogen peroxide, and pure water performs washing processing of a semiconductor wafer, using the semiconductor fabrication machines and equipment of such composition, it continues further and the 3rd processing tub 33 performs rinsing processing by pure water, in the former, it is processing as follows. That is, first, a semiconductor wafer is arranged and arranged in the carrier stowage 10 before processing, after having been contained by the carrier 11 before processing. The data entry unit which can input data required for processing of the semiconductor wafer in each carrier into each carrier 11 before processing is prepared, and down-stream-processing data and each processing tub 31, or the processing-time data of 33 is beforehand inputted to each carrier 11 before processing. Based on the down-stream-processing data and processing-time data which were inputted into each above-mentioned carrier 11 before processing, processing is advanced based on a schedule which the period when the processing period and the conveyance mechanism 20 which are taken to process the carrier 11 before each processing by the processing tub 31 or 33 convey the carrier 11 before each processing does not overlap.

A view 4 is drawing showing this processing schedule. This example is the case where the six-set carrier 11 of before processing is processed. t1 or t5 is the period of the conveyance mechanism 20 on a view 4 and accompanying the processing about the set [1st / of processing] before carrier 11, and this processing of operation, respectively. A period until, as for t1, the conveyance mechanism 20 conveys the set [1st / of processing] before carrier 11 to the 1st processing tub 31, The period when t2 processes the this set [1st / of processing] before carrier 11 by the 1st processing tub 31, The period when t3 conveys the set [1st / of processing] before carrier 11 by which the conveyance mechanism 20 was processed by the 1st processing tub 31 to the 3rd processing tub 31, The period when t4 processes the set [1st / of processing] before carrier 11 by the 3rd processing tub 33, and t5 are periods which convey the set [1st / of processing] before carrier 11 by which the conveyance mechanism 20 was processed by the 3rd processing tub 31 to the after [processing] carrier stowage 50.

t11 or t15 is the processing about the set [2nd / of processings] before carrier 11, and the period of the conveyance mechanism 20 accompanying this processing of operation, respectively. As for t11, the conveyance mechanism 20 returns from the position of the 3rd processing tub 33 to the position of the carrier stowage 10 before processing. A period until it conveys the set [2nd more / of processings] before carrier 11 to the 1st processing tub 31, The period when t12 processes the this set [2nd / of processings] before carrier 11 by the 1st processing tub 31, The period when t13 conveys the set [2nd / of processings] before carrier 11 by which the conveyance mechanism 20 was processed by the 1st processing tub 31 to the 3rd processing tub 31, The period when t14 processes the set [2nd / of processings] before carrier 11 by the 3rd processing tub 33, and t15 are periods which convey the set [2nd / of processings] before carrier 11 by which the conveyance mechanism 20 was processed by the 3rd processing tub 31 to the after [processing] carrier stowage 50.

t21 or t25 is the processing about the set [3rd / of processings] before carrier 11, and the period of the conveyance mechanism 20 accompanying this processing of operation, respectively, and these periods correspond to the processing about the above-mentioned set [2nd / of processings] before carrier 11 and the period t11 of the conveyance mechanism 20 accompanying this processing of operation, or t15.

t31 or t35 is the processing about the set [4th / of processings] before carrier 11, and the period of the conveyance mechanism 20 accompanying this processing of operation, respectively. As for

t31, the conveyance mechanism 20 returns from the position of the 3rd processing tub 33 to the position of the carrier stowage 10 before processing. A period until it conveys the set [4th more / of processings] before carrier 11 to the 2nd processing tub 32, The period when t32 processes the this set [4th / of processings] before carrier 11 by the 2nd processing tub 32, The period when t33 conveys the set [4th / of processings] before carrier 11 by which the conveyance mechanism 20 was processed by the 2nd processing tub 32 to the 3rd processing tub 31, The period when t34 processes the set [4th / of processings] before carrier 11 by the 3rd processing tub 33, and t35 are periods which convey the set [4th / of processings] before carrier 11 by which the conveyance mechanism 20 was processed by the 3rd processing tub 31 to the after [processing] carrier stowage 50.
t41, t45 and t51, or t55 is the processing about the 5th set and the set [6th / of processings] before carrier 11, and the period of the conveyance mechanism 20 accompanying this processing of operation, respectively, and these periods correspond to the processing about the above-mentioned set [4th / of processings] before carrier 11 and the period t31 of the conveyance mechanism 20 accompanying this processing of operation, or t35, respectively. And suppose that each processing tub 31 or the processing time of 33 is 5 minutes, respectively, for example, and the effective time of the medical fluid in each processing tub 31 or 33 is 18 minutes. Moreover, at the 1st and 2nd processing tubs 31 and 32, processing shall be performed for the temperature of mixed processing liquid at 85 degrees C.
By the way, when actually advancing processing based on such a schedule, it is made to control the weighing capacity of each medical fluid or pure water, a temperature up, the 1st, or 3rd processing tub 31, or supply operation to 33 by timing as shown in a view 5 at the former. It is the period which A shows the weighing capacity tub 61 which supplies a medical fluid and pure water to the 1st processing tub 31, or the various timing of 63 in a view 5, the period when a1 is performing weighing capacity, and a2 open the completion state period of weighing capacity, and a3 opens a solenoid valve 72 or 74, and supplies each medical fluid and pure water by which weighing capacity was carried out in the 1st processing tub 31. B shows the temperature up timing in the weighing capacity tub 63 which supplies pure water to the 1st processing tub 31, the aforementioned heater 68 is energized during b1, the temperature up of it is carried out to 90 degrees C, and until just before the 1st processing tub 31 is supplied, it is held at constant temperature with 90 degrees C. It is the period which supplies each medical fluid and pure water by which the period when C shows in the weighing capacity tub 81 which supplies a medical fluid and pure water to the 2nd processing tub 32, or the various timing of 83, and c1 is performing weighing capacity, and c2 opened the completion state period of weighing capacity, c3 opened a solenoid valve 92 or 94, and weighing capacity was carried out in the 2nd processing tub 32. D shows the temperature up timing in the weighing capacity tub 81 which supplies pure water to the 2nd processing tub 32, the aforementioned heater 87 is energized during d1, the temperature up of it is carried out to 90 degrees C, and until just before the 2nd processing tub 32 is supplied, it is held at constant temperature with 90 degrees C.
The period which E shows the various timing in the 1st processing tub 31, and e1 energizes at the aforementioned heater 36, and carries out the temperature up of the temperature of internal processing liquid to predetermined temperature, i.e., 85 degrees C, and e2 are periods when it changes internal-processing liquid into the use effective state, and e3 is a period which opens a solenoid valve 39 and discharges processing liquid outside. And the above-mentioned period e2 is set as less than [above / medical fluid use effective-time 18 minute].
The period which F shows the various timing in the processing tub 32, and f1 energizes at the aforementioned heater 37, and carries out the temperature up of the temperature of internal processing liquid to predetermined temperature similarly, and f2 are periods when it changes internal-processing liquid into the use effective state, and f3 is a period which opens a solenoid valve 40 and discharges processing liquid outside. And the use effective state period f2 of the above-mentioned internal-processing liquid is also set up within 18 minutes.
In addition, supply of the pure water to the 3rd processing tub 32 is always performed, and a part to have overflowed from the 3rd processing tub 33 is discharged outside through a solenoid valve 40.

[The trouble of background technology]
When processing the six-set carrier 11 of before processing to a schedule as shown in the view 4 of the above, at the former, it is made to perform supply to the weighing capacity of the various medical fluids in the weighing capacity tub 61, 63 and 81, or 83, a temperature up, and the processing tubs 31 and 32 to timing as shown in a view 5. Therefore, supply of a medical fluid and discharge are made also for the 2nd processing tub 32 which does not process in the period when washing processing of the 1st set to set [3rd / of processings] before carrier 11 which will be begun if processing is started is carried out by the 1st processing tub 31. Therefore, the medical fluid in the 2nd processing tub 32 will be discharged, without being used at all. For this reason, the use efficiency of the carrier 11 before processing over the medical fluid supplied to this processing tub 32 becomes bad, and a medical fluid is discharged from this processing tub 32, and the carrier 11 before processing is generated by the latency time in the carrier stowage 10 before processing for medical fluid exchange operation supplied again. Consequently, in the former, there is a fault that the productivity of washing processing is bad and useless use of a medical fluid occurs. Furthermore, in the weighing capacity tubs 61 and 81 which carry out weighing capacity of the pure water, until just before the 1st or 2nd processing tub 31 and 32 is supplied from the time of weighing capacity of the pure water being carried out, since it must energize at heaters 67 and 87, the fault that there is much useless power consumption is also.
[Objects of the Invention]
This invention is made in consideration of the above situations, and the purpose can process a semiconductor device for high productivity, and is to offer the semiconductor fabrication machines and equipment which can moreover prevent useless use of a medical fluid, and do not consume useless power, either.
[Summary of the Invention]
If it is in this invention in order to attain the above-mentioned purpose Classify many semiconductor wafers per manufacture, and contain on the carrier before processing and the data of predetermined down stream processing are inputted into the carrier before each processing. Contain the carrier before these processings to the carrier stowage before processing, and the carrier before processing is sent out one by one from this carrier stowage before processing based on each input data. Various processings are performed by two or more processing tubs to the semiconductor wafer contained in the above-mentioned front [processing] carrier. Weighing capacity of the processing liquid is carried out by the weighing capacity tub, and it controls to predetermined temperature, and supplies in each above-mentioned processing tub, and each above-mentioned carrier before processing is conveyed one by one at the following process according to the use sequence and the processing time of each above-mentioned processing tub according to a conveyance mechanism. by control means The supply timing of the various processing liquid to each processing tub is computed by computing the timing which the time of each above-mentioned processing tub and a conveyance mechanism does not overlap based on the data inputted into each above-mentioned carrier before processing. It is made to control discharge operation of the temperature control in supply to the weighing capacity, the temperature control, and each processing tub of various processing liquid in the above-mentioned weighing capacity tub, and each processing tub, or various processing liquid, and operation of a conveyance mechanism according to this calculation result.
[Example]
Hereafter, one example of this invention is explained with reference to a drawing.
A view 2 is a block diagram showing the composition of the electrical circuit portion of the semiconductor fabrication machines and equipment concerning this invention. In drawing, 100 is a CC unit which consists of a processing unit, memory, etc. The timer unit 110, and the input/output unit 120 are connected to this CC unit 100. To above-mentioned input / output unit 120, further 86 The weighing capacity completion sensor 69 in the front [processing] carrier stowage 10, the conveyance mechanism 20, the aforementioned weighing capacity tub 61, 63 and 81, or 83, 71 and 89 or 91 and a solenoid valve 64, 66 and 72, 74 and 84, or 92 Or it sets to the weighing capacity tub control unit 130 which consists of the 94th grade, the aforementioned processing tub 31, or The processing tub control unit 140 and the aforementioned heaters 36, 37, 68, and 88 which

consist of the solenoid valve 38 or 40 grades which control discharge operation of each medical fluid and temperature sensors 34, 35, and 67, the heater control unit 150 which consists of 87 grades, and the carrier stowage 50 after processing are connected, respectively.
In such composition, a semiconductor wafer is first contained on each carrier 11 before processing, and it arranges and arranges to the carrier stowage 10 before processing. At this time, down-stream-processing data required for processing of the semiconductor wafer in a carrier and each processing tub 31, or the processing-time data of 33 is inputted from a data entry unit on each carrier 11 before processing. The data inputted on the carrier 11 before each processing are supplied to the carrier stowage 10 before processing, and these data are further supplied to the CC unit 100 through an input / output unit 120. Based on these data, the CC unit 100 creates a schedule which the period when the processing period and the conveyance mechanism 20 which are taken to process the carrier 11 before each processing by the processing tub 31 or 33 convey the carrier 11 before each processing does not overlap. This schedule becomes the same thing as the view 4 of the above, when the number of the carriers which should be processed, for example is six. Furthermore, the CC unit 100 is based on the created schedule. Compute the supply timing of the medical fluid to the 1st and 2nd processing tubs 31, and it responds to this calculation result further. Timing, such as a medical fluid in the eccrisis time of the 1st and medical fluid supply of the 2nd processing tub 31 and 32, a heating up time, the effective time of a medical fluid, and a medical fluid and the weighing capacity tub 61, 63 and 81, or 83 or weighing capacity time of pure water, and temperature up start time of pure water, is determined. Such timing is supplied to the front [processing] carrier stowage 10, the conveyance mechanism 20, the weighing capacity tub control unit 130, the processing tub control unit 140, the heater control unit 150, and the carrier stowage 50 after processing through an input / output unit 120, and each operation is controlled.
Like the view 5 of the above, a view 3 performs washing by pure water by the 3rd processing tub 33, after the three-set carrier 11 of before processing to begin performs washing processing by the mixed medical fluid by the 1st processing tub 31. When performing washing by pure water by the 3rd processing tub 33 after performing washing processing by the mixed medical fluid by the 2nd processing tub 32 about the next three-set carrier 11 of before processing, it is drawing showing the various timing determined in the CC unit 100. It is the period which A shows the weighing capacity tub 61 which supplies a medical fluid and pure water to the 1st processing tub 31, or the various timing of 63 in a view 3, the period when a11 is performing weighing capacity, and a12 open the completion state period of weighing capacity, and a13 opens a solenoid valve 72 or 74, and supplies each medical fluid and pure water by which weighing capacity was carried out in the 1st processing tub 31. B shows the temperature up timing in the weighing capacity tub 63 which supplies pure water to the 1st processing tub 31, the aforementioned heater 68 is energized during b11, and the temperature up of the internal pure water is carried out to 90 degrees C.
It is the period which supplies each medical fluid and pure water by which the period when C shows in the weighing capacity tub 81 which supplies a medical fluid and pure water to the 2nd processing tub 32, or the various timing of 83, and c11 is performing weighing capacity, and c12 opened the completion state period of weighing capacity, c13 opened a solenoid valve 92 or 94, and weighing capacity was carried out in the 2nd processing tub 32.
D shows the temperature up timing in the weighing capacity tub 81 which supplies pure water to the 2nd processing tub 32, the aforementioned heater 87 is energized during d11, and the temperature up of the pure water is carried out to 90 degrees C.
The period which E shows the various timing in the 1st processing tub 31, and e11 energizes at the aforementioned heater 36, and carries out the temperature up of the temperature of internal processing liquid to predetermined temperature, i.e., 85 degrees C, and e12 are periods when it changes internal-processing liquid into the use effective state, and e13 is a period which opens a solenoid valve 39 and discharges processing liquid outside.
Similarly, F shows the various timing in the processing tub 32, f12 is a period when it changes internal-processing liquid into the use effective state, f11 is a period which energizes at the aforementioned heater 37 and carries out the temperature up of the temperature of internal processing liquid to predetermined temperature, and processing liquid is discharged [a solenoid

valve 40 is opened after this period f12, and] outside. Moreover, as usual, supply of the pure water to the 3rd processing tub 33 is always performed, and a part to have overflowed from the 3rd processing tub 33 is discharged outside through a solenoid valve 40.
In addition, it is made to start the temperature up of pure water by the weighing capacity tubs 61 and 81 in this example from five quotas which supply pure water to the 1st processing tub 31 or the 2nd processing tub 32.
As shown in a view 3, a medical fluid is supplied to the 1st processing tub 31, a temperature up is further carried out to the period of e11, and a medical fluid is not supplied to the 2nd processing tub 32 after that in the period when the three-set carrier 11 of before processing begun in the period e12 when it changes the processing medical fluid in this 1st processing tub 31 into the use effective state is processed. That is, supply of a medical fluid to the 2nd processing tub 32 is performed just before the processing in the 1st processing tub 32 is completed. That is, a medical fluid is not supplied in the 2nd processing tub 32 by which the 1st set to set [3rd / of processings] before carrier 11 which will be begun if processing is started does not process in the period by which washing processing is carried out by the 1st processing tub 31, but the medical fluid discharged vainly conventionally can be saved. Consequently, the use efficiency of the carrier 11 before processing over the medical fluid supplied to the processing tub 32 can be raised. Moreover, since the timing which supplies a medical fluid to this processing tub 32 can see and determine the advance situation of the processing in the 1st processing tub 31, the latency time in the carrier stowage 10 before processing of the carrier 11 before processing is made to the minimum. Therefore, according to this example equipment, the productivity of washing processing can be raised and generating of useless use of a medical fluid can be prevented. Furthermore, in the weighing capacity tubs 61 and 81 which carry out weighing capacity of the pure water, since pure water is energized at heaters 67 and 87 and is made to carry out a temperature up from before fixed time of the timing supplied to the 1st or 2nd processing tub 31 and 32, useless power consumption can be saved.
In addition, this invention is not limited to the above-mentioned example, and cannot be overemphasized by that various deformation is possible. For example, although the above-mentioned example equipment explained the case where the use term of validity of the mixed medical fluid was the time of 18 minutes, this may be the term of validity of the number of times of how many times in a usage count which is said. The kind of medical fluid, the number of processing tubs, the use sequence of a processing tub of your changing so that the processing conditions of the semiconductor wafer to process may be suited, etc. are still more natural. Furthermore, although the case where the above-mentioned example equipment was what performs washing processing of a semiconductor wafer was explained, this can be carried out also to the equipment which performs other etching processings etc.
[Effect of the Invention]
Since supply and the temperature up of the effective medical fluid to a processing tub, or discharge is performed according to this invention as explained above Since the use efficiency of a carrier in which the medical fluid in each processing tub is received is good, the heating up time in the weighing capacity tub which performs weighing capacity of pure water can be shortened, the carrier before processing is not kept waiting for exchange operation of the medical fluid of a processing tub and processing advance of a carrier can be performed A semiconductor device can be processed for high productivity and the semiconductor fabrication machines and equipment which can moreover prevent useless use of a medical fluid, and do not consume useless power, either can be offered.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
The block diagram of semiconductor fabrication machines and equipment with a common view 1, the block diagram showing the composition of the electrical circuit portion of the semiconductor fabrication machines and equipment which a view 2 requires for this invention, drawing showing [3] the timing of the above-mentioned example equipment of operation, drawing showing an example of the schedule of processing [in / the equipment of the view 1 of the above / in a view 4], and a view 5 are drawings showing the timing of equipment of operation conventionally.
10 [.. A conveyance mechanism,, 31, 32, 33 / .. A processing tub, 50 / .. An after / processing / carrier stowage,, 51 / .. An after / processing / carrier,, 61 62 63, 81, 82, 83 / .. A weighing capacity tub, 100 / .. A CC unit, 110 / .. A timer unit, 120 / .. An input/output unit,, 130] .... A front [processing] carrier stowage, 11 .. A front [processing] carrier,

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[Translation done.]